recovery of the so-called "gap") *or* (2) assurance of recovering their claimed embedded investment through some regulated amortization process substantially similar to traditional RORR, in which earnings would be capped at or close to the authorized level.[46] Adoption of this proposal, as detailed below, squarely resolves any "takings" concerns, since it lets the ILECs themselves choose between:

- a *make whole* approach, in which responsibility for risks and rewards of ILEC investment are shifted back to ratepayers, as they were under RORR; or
- a *make money* approach, in which the ILECs would be required to treat the "gap" as any ordinary capital investment, like any non-regulated company operating in a competitive market, in exchange for the opportunity to exploit their asset base and retain any earnings generated therefrom, subject only to the reasonableness standard.[47]

As the Ad Hoc Committee noted in its initial comments, the Commission cannot confer upon the ILECs the security of rate of return regulation (*i.e.*, guaranteed recovery of embedded costs) while concurrently granting them the pricing and earnings flexibility enjoyed by non-regulated firms.[48] What the ILECs are seeking is a paradigm in which they enjoy all of the *protections* traditionally provided under RORR while retaining all of the *benefits* of a price cap system with no sharing or earnings cap.

The traditional RORR model created a "social contract" between the utility and the public whereby the utility received an exclusive franchise to act as monopoly provider of the regulated service (and assured recovery of investments

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46 NPRM at ¶ 265.

47 *See supra* note 45.

48 Ad Hoc Initial Comments at 56.

they incurred to provide regulated services) in exchange for limiting its prices to those necessary to produce a "fair return" for shareholders. In short, the ILECs traded the opportunity to enhance earnings in exchange for a nearly risk-free earnings stream. It is against the backdrop of this traditional regulatory regime that ILEC confiscation arguments should be framed.

The Ad Hoc Committee's option-driven proposal would allow each ILEC to decide whether it or its ratepayers are to bear the risks and burdens and reap the rewards and benefits of the ILEC's investment decisions. Since an ILEC has the option of electing to be *made whole*, if it did not exercise that option, but instead chose to *make money* under the unregulated earnings option, but then failed to recover its costs and embedded investment, it could not later claim an unlawful taking. The Committee's review of the comments in this proceeding indicates that no party has opposed this proposal.[49] Accordingly, the Commission should adopt this proposal and thereby hold the ILECs accountable for the investment decisions they make.

[49] Given the abbreviated time for reviewing comments and preparing reply comments , and the voluminous nature of the comments that were filed, any claims as to the contents of other comments, whether by the Ad Hoc Committee or other parties, should be qualified.

CONCLUSION

For the foregoing reasons, the Commission should adopt the Ad Hoc Committee's proposal that ILECs be given the option of choosing between a *make whole* approach to regulation or a *make money* approach to regulation, that further, the Commission should take such other action as is consistent with the view expressed above.

Respectfully submitted,

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ESTABLISHING THE X-FACTOR FOR THE FCC LONG-TERM LEC PRICE CAP PLAN

Price Cap Performance Review for
Local Exchange Carriers

CC Docket 94-1

Lee L. Selwyn
Patricia D. Kravtin

prepared for the

Ad Hoc Telecommunications Users Committee

December, 1995

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Preface | ESTABLISHING THE X-FACTOR FOR THE FCC LONG-TERM LEC PRICE CAP PLAN

In its *Fourth Further Notice of Proposed Rulemaking* (FFNPRM) issued September 27, 1995 in the Commission's Price Cap Review proceeding (CC Docket 94-1), the Commission sought further comment on a broad range of issues relating to the establishment of a long-term price cap plan. Many, if not most, of these issues relate to the Commission's tentative conclusion that the permanent X-Factor should be based upon a Total Factor Productivity (TFP) model, and in particular on the model developed in the Christensen Associates, Inc. Study that was commissioned by the United States Telephone Association (USTA). The Ad Hoc Telecommunications Users Committee (Ad Hoc Committee) commissioned Economics and Technology, Inc. (ETI) to prepare this report as part of the Committee's response to the FFNPRM. In this report, ETI addresses the specific issues raised in the FFNPRM, with emphasis on those issues concerning the Christensen/USTA TFP model and its application to the establishment of a permanent X factor.

The authors are President and Vice President—Senior Economist, respectively, at ETI. They gratefully acknowledge the invaluable advice and assistance contributed by Dr. Ersnt R. Berndt, Professor of Applied Economics at the Alfred P. Sloan School of Management, Massachusetts Institute of Technology, in the preparation of this study. Research and analytical support was provided by Jennifer L. Gray, Irena V. Tunkel, and Sonia N. Jorge of ETI. The authors also benefitted from the helpful comments and suggestions of their colleague, Susan M. Gately, Vice President of ETI.

Boston, Massachusetts

December 15, 1995

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1 INTRODUCTION AND SUMMARY

Purpose of this Report

This report provides an important follow-up to our previous study, *An Empirical Estimate of the LEC Price Cap "X-Factor" based upon Historic National LEC Productivity and Input Price Trends,* prepared by ETI on behalf of the Ad Hoc Telecommunications Users Committee in June, 1994, in the first phase of this proceeding. In that earlier work, ETI demonstrated that the correct calculation of a TFP-based X-Factor must reflect the historic post-divestiture LEC productivity growth rate adjusted to recognize the decreasing real price of LEC inputs. In that study, we accepted the general findings of the Christensen/USTA May, 1994 study with respect to its estimate of the *absolute* LEC industry TFP.[1] We noted, however, that in *applying the results* of the Christensen/USTA study to the calculation of the X-factor, USTA failed to reflect the indisputable fact that over the very same post-divestiture period studied by Christensen, LEC input prices *decreased* in real terms, i.e., LEC input price growth was significantly less than the economy-wide rate of price inflation. We showed why USTA's failure to incorporate an input price adjustment based upon post-divestiture conditions resulted in an understated productivity offset and a correspondingly excessive annual price cap rate adjustment, creating a direct and inappropriate transfer of wealth from ratepayers to the LECs.

ETI has continued to be an active participant in price cap and incentive regulation matters before state regulatory bodies.[2] In undertaking this study, as with previous reports prepared by ETI for the present proceeding, we have drawn in part on knowledge and experience obtained in those state proceedings. In particular, in the current price cap review

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1. As we demonstrate here, the Christensen/USTA TFP methodology is seriously flawed both as to the sources and consistency of its underlying data as well as numerous methodological deficiencies. Moreover, while we accepted, for purposes of our previous examination, the Christensen//USTA estimate of LEC industry TFP, we expressly rejected the attempt by Christensen/USTA to transform that result into some sort of "differential" TFP that reflected the extent to which LEC industry productivity growth exceeded economy-wide productivity growth.

2. See, e.g., California PUC, I.95-05-047; New York PSC Case 92-C-0665; Massachusetts DPU 94-50; Connecticut DPUC 95-0301; Maine PUC 94-123, 94-254; Illinois Commerce Commission 92-0448.

proceeding before the California Public Utilities Commission,[3] ETI has had the opportunity to participate in the cross-examination of the principal author of the Christensen/USTA study, Dr. Laurits Christensen, and also to prepare and propound information requests concerning his so-called "1993 Update" to the original May, 1994 Christensen/USTA study that USTA provided to the FCC in an *ex parte* filing on January 20, 1995. We believe the information that ETI was able to obtain as a result of the California proceeding is highly relevant and informative to the present performance review. It provides for specific quantitative and qualitative findings that otherwise would not have been adduced based solely upon the information available in the interstate jurisdiction. In addition, evidence from the California proceeding provides overwhelming demonstration that the Christensen/USTA study fails to meet the empirical requirements established by the Commission in the FFNPRM.[4]

Summary

In this new report, we reiterate the importance of an input price adjustment, and we further refine the measurement of input price changes to reflect measures of price movements publicly available from disinterested sources[5] as well as hedonic adjustments to the nominal price changes.[6] The desirability of relying upon publicly available information from objective, disinterested sources vis-a-vis utilizing internally generated self-serving LEC data is obvious and well-recognized by the Commission in the FNPRM. In this report, we identify and apply price asset deflator data available from the Bureau of Labor Statistics (BLS) in lieu of LEC-generated Telephone Plant Index (TPI) data in the calculation of input prices and quantities.

As established in the economics and statistics literature, hedonic price changes adjust indexes to account for changes in quality and/or capacity of the products over time. Such adjustments are especially necessary for the types of capital inputs used in the telecommuni-

3. California PUC Order Instituting Investigation (I.) 95-05-047, *Incentive-Based Regulatory Framework for Local Exchange Carriers.*

4. See FFNPRM, para. 15.

5. Rather than rely upon objective, disinterested sources, the Christensen/USTA study relied upon price indices generated internally by each of the participating LECs. As we explain, these critically important data series are neither replicable nor verifiable, and in fact are considered "proprietary" by the LECs and as such were not even disclosed.

6. In addition to their other deficiencies, the LEC input price indices fail entirely to reflect qualitative changes in the nature, character and capacity of LEC capital inputs over the period of the Christensen/USTA study, resulting in a systematic upward bias in the level of LEC capital costs.

cations industry, i.e., inputs containing computer chips, digital electronics, fiber optics, digital switching equipment, and other high-technology items, whose specifications and characteristics have evolved rapidly over the post-divestiture study period. For these types of inputs, the adjustment of price indexes to account properly for changes in quality and/or capacity over time is a very significant issue. Failure to make hedonic price adjustments will necessarily overstate input price growth and result in an X-factor that is misspecified and most likely biased downward.

This report also emphasizes the necessity of developing an interstate-only TFP measure, rather than one based upon total company operations. A TFP based upon total company operations, as developed in the Christensen/USTA study, results in an understatement of output growth rates and hence an understatement of TFP. Since the purpose of the price cap rate adjustment mechanism is to replicate on an industry-wide basis the same types of jurisdictional costs that had been considered on a company-specific basis under rate of return (ROR) regulation, the use of anything other than jurisdictional productivity growth measurements will produce disparities as between the interstate and state jurisdictions for which no corrective mechanism precisely exists.

This report also highlights a number of other methodological deficiencies in the Christensen/USTA study including:

- The failure to recognize the distinction between debt and equity in the application of taxes as part of the rental price formula;
- The failure to apply depreciation rates which reflect the fundamental economic conditions of capital recovery for the LECs; and
- The failure to use direct, quantity-based measures of output.

Our analysis demonstrates that, when the necessary corrections of the various deficiencies that have been described above are made to the Christensen/USTA study, the X-Factor is found to be significantly greater than both the paltry 2.1% as claimed by USTA and even the highest 5.3% (no sharing/no earnings cap) level adopted by the Commission in the *First Report and Order.*

The results of our analysis are presented in Section 4 of this report. As we show, the correct X-Factor (including the input price differential and a modest 0.5% Consumer Productivity Dividend) is 9.9% for jurisdictionally interstate services. This should be compared with the "base case" *total company* X-factor of 5.1%, which was derived directly from Christensen's total company study (without corrections) and including both an input price differential and the 0.5% Consumer Productivity Dividend. Although only the interstate X-factor is relevant for application in the interstate jurisdiction, we also present a corrected

calculation of the total company X-factor for comparison purposes. That corrected total company result is 7.1%.

2 | EMPIRICAL REQUIREMENTS

Notwithstanding methodological deficiencies, the Christensen Study, as a threshold matter, does not satisfy the empirical requirements identified in the FFNPRM as necessary in order to meet the Commission's general criteria for an X-factor adopted in a long-term price cap plan.

In the FFNPRM, the Commission sets forth three basic criteria that should be satisfied by any X-factor that is ultimately adopted for a long-term price cap plan:

(1) The X-factor must be economically meaningful;

(2) The X-factor should ensure that ongoing gains by the LECs in reducing unit costs are passed through to consumers; and

(3) The calculation of the X-factor should be reasonably simple and be based on accessible and verifiable data.[7]

Consistent with the fulfillment of these three criteria, and particularly the third one, which requires that the calculation of the X-factor be "*reasonably simple and based on accessible and verifiable data,*" the Commission identifies a number of concerns and corresponding requirements specifically relating to empirical issues.

For example, the Commission notes its concern that "the data required to calculate the X-factor in our long-term price cap plan be publicly available in a timely fashion," and correspondingly, that "the availability and timeliness of the data required to develop the X-factor will be an important consideration in our decision whether to adopt a particular method for the long-term price cap plan."[8] The Commission also notes its concern regarding data requiring proprietary treatment and how LEC interests could be balanced with

7. FFNPRM, para. 16.

8. *Id.*, para 17.

parties' abilities to participate effectively in the proceeding.[9] The Commission further directs parties "to explain how aggregation would affect the ability of the Commission and interested parties to verify data and replicate the results of studies for the different X-factor methods."[10] The Commission also indicates its tentative conclusion that company or study area specific data may be necessary "to ensure auditability."[11]

The Commission expresses a number of concerns regarding the calculation of the capital input component of the TFP in particular, recognizing that the capital index "raises especially difficult issues due to the fact that it is based on a number of complex judgments."[12] For example, the Commission seeks comment on the "reliability of the method and the data used in the Christensen Study to compute replacement values";[13] "the validity of the economic stock adjustment factor method and on the validity of the data on which it relies,"[14] "how closely the data [that is used to derive current dollar investment] were audited internally by the LECs;"[15] whether the telephone plant indices (TPIs) used to deflate current dollar investment "could be calculated in a timely manner and from publicly available data;"[16] and "whether the data required to calculate the implicit rental price in future TFP updates would be publicly available in a timely fashion."[17]

Finally, and in a particularly firm statement, the Commission declared that:

> Any party submitting studies, proposed methods for calculating an X-factor, or other empirical information must furnish promptly upon request by Commission staff or any party to this proceeding workpapers and any other data necessary to replicate the results submitted in this proceeding.

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9. *Id.*, para.19.

10. *Id.*, para.21.

11. *Id.*, para. 21.

12. *Id.*, para. 32.

13. *Id.*, para. 42.

14. *Id.*, para. 43.

15. *Id.*, para. 44.

16. *Id.*, para. 45.

17. *Id.*, para. 48.

> If a party fails to do so, we will accord no weight to those studies, methods, or empirical information in our deliberations.[18]

Notwithstanding methodological deficiencies described in Section 3 of this report, as a threshold matter, the Christensen Study submitted by USTA does not come close to satisfying the Commission's empirical requirements as clearly and repeatedly set forth in the FFNPRM. As with any study, the validity and reliability of the Christensen Study results depend critically upon the quality and accountability of the underlying data as well as upon the ability to verify and replicate it. If the data is biased or in any way contaminated, then the study results will not be valid, regardless of the integrity of the study methodology.[19] Information obtained during the course of the current price cap review proceeding before the California Public Utilities Commission (CPUC),[20] where Dr. Christensen appeared as a witness for Pacific Bell, confirms a fundamental lack of knowledge and control on the part of Dr. Christensen vis-a-vis his client LECs with respect to the development of key underlying data *upon which he relied* in calculating the LEC TFP results presented in the Christensen/USTA study. Information obtained in the California proceeding also confirms the inability of the FCC and interested parties to replicate and verify key underlying data series used to calculate the TFP results. As a consequence, the Christensen/USTA study fails to satisfy the Commission's general criteria for an X-factor adopted in a long-term price cap plan, i.e., that the calculation of the X-factor be "reasonably simple and based on accessible and verifiable data."

Evidence recently adduced in California sheds new light on problems with the underlying data and methodology used in the Christensen/ USTA study to develop TFP results, and on the process by which the so-called "1993 Update" was prepared.

The California PUC is currently engaged in the second performance review, I.95-05-047, of the price cap regulation system (the "New Regulatory Framework" ("NRF")) that became effective as of January 1, 1990.[21] In this review proceeding, Dr. Christensen sponsored testimony on behalf of Pacific Bell with respect to the May, 1994 and January,

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18. *Id.*, para 15; see also para. 148.

19. Of course, similarly, integrity of the underlying data cannot compensate for a flawed methodology.

20. California PUC, I.95-05-047, Transcript of September 27, 1995 and interrogatories of the California Committee for Large Telecommunications Consumers (CCLTC), admitted as Exhibit 8.

21. The California PUC adopted price cap regulation for Pacific Bell and GTE-California in Phase II of its "Alternative Regulatory Frameworks" investigation, I.87-11-033. D.89-10-031, 33 CPUC 2d 43 (1989).

1995 LEC TFP studies he had prepared for submission by USTA in the FCC's price cap performance review NPRM, CC Docket 94-1. Parties in the CPUC proceeding had the opportunity to cross-examine Dr. Christensen in a live hearing and also to serve Dr. Christensen directly with information requests concerning his LEC TFP studies. The information obtained through cross-examination and discovery of Dr. Christensen shed new light on problems with the underlying data and methodology used to develop Christensen's TFP results and on the process by which Christensen's "1993 Update" study was prepared.

First, key pieces of underlying data that had been revised in the 1993 Update cannot be independently verified, either in their original (May, 1994) or revised (January, 1995) incarnations. They are not "publicly available data" such as those included in LEC Form M reports or other public filings (e.g., ARMIS reports submitted to the FCC).[22] Two critical components of the capital index, i.e., the 1984 capital stock data and the telephone plant indexes (TPIs), fall in this category. With respect to the TPIs in particular, Dr. Christensen testified that "the TPIs are the most difficult of all these series to verify in that they are based on highly confidential information from the individual LECs."[23] For example, Dr. Christensen was asked specifically to explain the seemingly anomalous TPI for the Central Office Equipment (COE) plant category for Bell Atlantic, which had actually increased by 49% over the period 1984 to 1992, whereas the LEC composite TPI for COE had *decreased* by 7.3% over that same period.[24] Dr. Christensen conceded that the Bell Atlantic "data for TPI obviously looked different from those for other companies."[25] He explained that he had requested that Dr. Meitzen of his staff verify the accuracy of the TPI data with Bell Atlantic. He testified that, to his knowledge, Bell Atlantic did not provide any further information or data to support its assertion that the COE TPI values were an accurate reflection of prices that the company paid.[26] Moreover, Dr. Christensen also indicated that he would have no basis to know if Bell Atlantic's assertions were correct, because he did not look at Bell Atlantic's accounting records.[27]

With regard to the capital stock data, Dr. Christensen first indicated that the data was based upon original cost, which would come from actual accounting records, as opposed to

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22. California PUC, I.95-05-047, Transcript, September 27, 1995, at 197.

23. *Id.*, at 198.

24. USTA *ex parte* filing, CC Docket 94-1, February 3, 1995.

25. California PUC, I.95-05-047, Transcript, September 27, 1995, at 220.

26. *Id.*, at 219-220.

27. *Id.*

reproduction costs, which would be "an estimate of some sort."[28] Dr. Christensen subsequently corrected his testimony, stating that, in fact, the capital stock data utilized in the Christensen/USTA studies reflected "reproduction cost, or the current cost of the capital stock as computed by each of the LECs," and admitted that such data "does not appear in the Form M."[29] When asked if he knew how the reproduction costs for each of the capital stock figures were calculated, Dr. Christensen acknowledged that each of the LECs determined on their own what the current replacement cost would be and that he did not know the specific technology assumptions used by each of the LECs in calculating the reproduction costs.[30] Nor could Dr. Christensen provide the specific details concerning the nature of the correction made by NYNEX that produced the $13.5-billion downward revision in the NYNEX 1984 gross base capital stock figure.[31]

As a general proposition, Dr. Christensen does not have documentation regarding how the various revisions incorporated in the data used in the 1993 Update Study were made. Dr. Christensen testified that he had no documentation regarding how the corrections took place or came about by the LECs, because it was the LECs who made the corrections.[32] Indeed, Pacific Bell's responses to information requests propounded by the California Committee for Large Telecommunications Consumers (CCLTC) indicate that Dr. Christensen was not provided with revised data from most of the nine LECs covered by his study until after December 19, 1994, or less than a month before USTA's submission of the 1993 Update Study to the Commission took place.[33] Pacific Bell's responses to these same information requests also indicate Dr. Christensen "does not have any workpapers supporting the adjustment/corrections" and "Pacific Bell has been advised that to the extent that USTA has such workpapers, USTA is not authorized to release them."[34] Furthermore, Dr. Christensen acknowledged that the information provided to the Commission by USTA in the February 3, 1995 *ex parte* filing identifying data differences between the USTA TFP Study submitted in May, 1994 and the 1993 Update submitted by USTA in January, 1995,

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28. *Id.*, at 227-228.

29. *Id.*, at 231.

30. *Id.*, at 233.

31. *Id.*, at 237; USTA *ex parte* filing, CC Docket 94-1, February 3, 1995.

32. *Id.*, at 209.

33. Pacific Bell Responses to CCLTC First Set of Information Requests, I.95-05-047, Nos. 12 and 12A.

34. *Id.*, Exhibit 8, Nos. VI and VII.

was not sufficient to verify the accuracy of the composite data used in the 1993 Update.[35] The information contained in USTA's February 3, 1995 *ex parte* filing provides individual LEC data only for those specific LECs for which data was revised; corresponding data for the other LECs, as well as data series for individual LECs that were not revised in the "1993 Update," have never been provided by USTA and specific requests for their production were refused by Pacific Bell. In order to replicate the composite data series used in the Christensen/USTA study, it would be necessary to have data for all data series for all nine of the LECs that were studied by Dr. Christensen.[36] According to Pacific Bell's responses to CCLTC information requests, individual company data "that is in the possession of either Dr. Christensen or USTA is subject to nondisclosure requirements and, therefore, cannot be provided."[37]

The lack of publicly-available and verifiable data underlying the 1993 revisions is of particular concern, given the circumstances surrounding the submission of the so-called 1993 Update. In particular, the 1993 Update would appear to have been motivated by the Bureau of Labor Statistics' (BLS) downward revision to the economy-wide productivity growth rate, announced in the summer of 1994, from 0.9% to 0.3%.[38] Under USTA's approach to calculating the X-factor (in which the input price differential between LECs and the economy as a whole is incorrectly assumed to be zero), the economy-wide productivity growth rate is subtracted from the LEC TFP measure. Thus, a reduction in the economy-wide productivity growth rate from 0.9% to 0.3% produces a 0.6% increase in the X-factor, worth approximately $1.5-billion in revenues to the LECs over the next four years.[39] As testified by Dr. Christensen, the Bureau of Labor Statistics revised its estimate of economy-wide productivity growth in the summer of 1994. However, neither Dr. Christensen nor USTA filed any revisions to the May 1994 study to reflect the BLS change until January 20, 1995, with their submission of the 1993 Update which *also* incorporated the revised data that Dr. Christensen had received from the LECs. Use of the revised LEC data had the effect of ameliorating a portion of the increase in the X-factor that would have otherwise occurred based solely upon the revised BLS economy-wide productivity growth figure. The

35. California PUC, I.95-05-047, Transcript, September 27, 1995, at 212.

36. *Id.*, at 211-212.

37. Pacific Bell Responses to CCLTC First Set of Information Requests, Phase I, I.95-05-047, No. VIII.

38. California PUC, I.95-05-047, Transcript, September 27, 1995, at 201.

39. Interstate LEC revenues are approximately $25-billion annually. Thus, a 0.1% increase in the X-factor will translate into a $25-million decrease in the annual price cap rate adjustment. This effect will, of course, be cumulative from one year to the next; i.e., in the first year, the impact is $25-million, in the second year, it is $50-million, in the third year, it is $75-million, and in the fourth year, it is $100-million. Thus, over a four-year period, each 0.1% change in the X-factor represents roughly $250-million in LEC interstate revenues.

1993 Update had the effect of decreasing TFP by roughly .2%, which would be worth approximately $500-million in cumulative revenues to the LECs over the next four years.[40]

Significant changes in the data used and the information provided would have to occur in order to bring the Christensen/USTA study into compliance with the Commission's empirical requirements.

As discussed above, it is simply not possible for the Commission or interested parties to replicate and verify most of the key underlying data series that were used by Christensen Associates to calculate the TFP results produced by the Christensen/USTA study for several reasons:

(1) The Christensen/USTA study includes data that do not come from publicly available and verifiable series.

(2) The Christensen/USTA study aggregates data from nine individual LECs in a manner that cannot be audited or verified given the confidential proprietary treatment of that data.

(3) The updated Christensen/USTA study relies upon revised data series that are not documented.

These deficiencies are by themselves fully sufficient to warrant rejection of the Christensen/USTA studies as a basis for determining the permanent X-factor in the FCC price cap program. That verification and replication are essential is confirmed by the obvious flaws and anomalies in the small fraction of the total data set that has been disclosed and for which no explanation has been forthcoming. In order to rectify these problems and comply with the Commission's empirical requirements and criteria for an X-factor adopted in a long-term price cap plan, significant changes in the data used in any TFP study and in the level of information provided to the Commission and interested parties would have to occur.

In later sections of this report, we discuss the elements of a proper TFP study in response to issues raised in the FFNPRM. In those later sections, we offer specific ways in

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40. The 1993 Update also had the effect of reducing the LEC input price differential vis-a-vis GDP-PI from 2.6% to 2.13%. Although USTA did not accept the inclusion of an input price differential in the calculation of the X-factor, this revision was clearly intended as a "hedge" against the possibility that the Commission would adopt the input price differential as recommended by Ad Hoc and by a number of other parties. From the original May 1995 study, the combination of LEC TFP and the input price differential would have produced an X-factor of 5.2% (before adding the 0.5% Consumer Productivity Dividend). With the revisions to both TFP (2.46%) and input price differential (2.13%) reflected in the January, 1995 submission, the corresponding X-factor would be only 4.6% (without the CPD), representing approximately $1.25-billion in cumulative LEC revenues over the next four years.

which some of the data problems inherent in the Christensen/USTA study (e.g., the use of internally-generated LEC TPI series and the use of total company data) could be corrected, and we quantify the effect upon the X-factor that would result were these corrections made. Other empirical shortcomings of the Christensen/USTA study can be rectified only with the provision of additional information from USTA, including the public release of individual LEC data series for all nine LECs included in the Christensen/USTA study and a comprehensive set of workpapers and any other data necessary to fully replicate and verify the study results pursuant to Paragraph 15 of the FFNPRM. To this end, The Ad Hoc Committee served a set of data requests on USTA seeking the full array of the underlying data used in both the revised and original Christensen/USTA studies as well as additional information needed to replicate Christensen's TFP results.[41] USTA provided some (but by no means all) of the needed information in its response dated November 28, 1995.[42] Still other empirical issues, such as the need to take into account hedonic effects upon capital input prices, may require further work to resolve, yet are critically important in arriving at a properly-specified X factor.

In a *Motion for Extension of Time* filed November 8, 1995 in this proceeding, USTA indicates that it "is in the process of developing a Total Factor Productivity Review Plan (TFPRP)." According to USTA, this TFPRP "will provide a formal means of displaying all the inputs and calculations necessary to develop the productivity offset" and "enable all the parties, including the Commission, to easily analyze the data ... and provide a format to demonstrate that the calculation of a TFP-based offset yields results that can be easily duplicated."[43] Display of inputs and calculations and the ability to duplicate results is certainly necessary in order to satisfy the Commission's criteria for a permanent X-factor. However, of even greater importance is the ability of interested parties and the Commission to obtain and verify the actual *data* used in the calculations. As discussed above, many of the problems with the Christensen/USTA study relate to empirical issues, such as the accessibility of data, validity of data, and confidentiality of data. Merely displaying inputs and calculations in a tariff review plan-type format does not address the serious substantive data problems raised in the FFNPRM.

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41. Information requests of the Ad Hoc Committee to USTA, dated November 10, 1995.

42. In particular, USTA provided copies of the data diskette and printouts containing the composite data series used in the productivity calculations for the USTA studies submitted to the Commission in May 1994 and in January 1995. However, as of this writing, USTA has responded to questions concerning reconciliation of various data used in the capital input analysis or seeking the underlying individual LEC data for each of the nine LECs incorporated in the composite data series used in the productivity calculations. See USTA *Ex Parte* Letter dated November 28, 1995.

43. Opposition to the Motion for Extension of Time of Ad Hoc Telecommunications Users Committee and Motion for Extension of Time of the United States Telephone Association, CC-Docket Nos. 94-1, 93-124, and 93-197, November 8, 1995, p. 4.

At a minimum, the TFPRP must include all data series provided by each of the participating LECs as well as all of the LEC composite series used in the TFP calculations. It must provide the manner in which the individual LEC data is weighted and combined to create the composite series. It must contained *detailed* methodological narratives as to how each of the participating LECs compiled, adjusted, revised, aggregated, or otherwise manipulated any of the data series that it furnished. To the extent that any of this work is outside of the supervision and control of Christensen Associates or USTA itself, the TFPRP must include statements explaining how each of the LECs performed its data analyses and documenting all assumptions underlying those calculations. For example, where "current" rather than "book" values are used (as in the 1984 base capital stock figures), the LECs should individually be required to provide detailed explanations as to how such "current" valuations were made, what specific technology and network architecture assumptions were incorporated into the analysis, whether the "current" values were based upon straight repricing of existing plant, functional replacement of plant using (then available) least-cost technology, data sources used in making such valuations, and other relevant information. The TFPRP should be structured so as to allow the Commission and interested parties to modify individual assumptions, replace proprietary data series with publicly available sources, adjust for quality effects to the extent these are ignored in LEC capital input price indices, and in general to test the sensitivity of the Christensen/USTA results to changes in underlying data, assumptions and computational methods. Anything short of that will not satisfy the Commission's explicit requirement, and will not rehabilitate what must otherwise be seen as a highly discredited foundation upon which USTA relies for its X-factor recommendations.